1809

#3

Tetanus
1 Vol

An Inaugural Dissertation

On Tetanus

for the Degree of Doctor of Medicine

Submitted to the Examination of

The Rev: Mr. Dowel S. T. P. Provost

The Trustees and Medical Professors of

The University of Pennsylvania.

By Seth Cattell

of Pennsylvania.

Section I.

The subject of this essay has engaged my attention, by the contrast, which it presents between the apparent magnitude of cause and effect. How trifling, oftentimes, are the remote causes of Tetanus: How formidable, how violent the disease? The wild irregularity of vital action is, in no instance, more striking in its form, nor more awful in its progress, than in true tetanic affection. Nature in such cases suffers the most intensive agony.

I take up this most violent of diseases, in order to inform myself more minutely respecting its nature and cure. If my inquiries among the authors, who have treated of it, will enable me to meet cases hereafter with better resources than I should otherwise possess, I shall have reason to think the time, spent in consulting them, has been happily employed.

The word tetanos is greek, from tieno, I extend. I stretch out; and of course it litterally signifies a tension, extension, or spasm. In medical language, tetanus being applied to the condition of living organs, denotes a spasm of the muscular system by which the body and members are extended, and by which rigidity and tension is produced in the muscles themselves.

This tetanus or spasm, affects, almost exclusively, the muscles, which are subserviant to voluntary motion. The voluntary muscles are more universally affected with tension, in this, than in any other form of spasmodic disease. And they are also more permanantly affected, giving greater and more durable extension to the body. The greeks, therefore, may be considered to have applied the term tetanos very properly to a universal rigid spasm of the

voluntary muscles.

Those early cultivators of medicine distinguished tetanus into several kinds, or varieties. These distinctions, which will afterwards be considered, have been very generally adopted by the Bayzantine physicians, by the Arabians, and by almost every modern who has written on this disease.

Section, II.

In giving a history of the form and symptoms of tetanus we may divide the course of the disease into three stages.

The first or forming stage, is sometimes transient, but often of considerable duration. When it is the result of an alarm, fright or other violent emotion, its attack is sudden and severe. When it proceeds from an organic lesion, dampness, cold or organic irritability, it forms slowly, and arises gradually to its most violent state. The first stage commences with the earliest symptoms and continues untill rigidity is extended over the whole body.

When the disease proceeds from excessive emotion, it begins to form immediately, and the general rigidity is rapidly established. See the case related by Dr Rogers, and published in Dr Bartons Medical & physical Journal.

When it proceeds from cold, the first symptoms are felt in two or three days; and when it arises from organic lesion is is usually several days before any tetanic symptoms are perceived; and these often set in when the injured part is free from pain, or even when it has intirely healed.

Dr Mosely observes, that after a wound or chirurgical opperation, in the West Indies, he never found any time untill the patient was intirely well,

exempted him from this disease.

The attack in every case commences with a slight tension at the ~~precor~~ precordia which is soon accompanied by stiffness of the back part of the neck. The uneasiness at the precordia, gradually increasing, at length amounts to severe pain. The stiffness of the neck renders it difficult to move the head. The jaws also become stiff. They cannot be moved without pain. A sense of structure is perceived at the root of the tongue. A difficulty of swallowing takes place, which frequently terminates in a total interruption of deglutition. In this situation the patient refuses nourishment, as deglutition is not only painful in itself, but excites a return of the spasm.

The pulse is very different in different cases in this stage of the disease. Sometimes it is small and remarkably frequent; and sometimes slow and hard. The lower extremities, even before they are much affected with spasm, are feeble, and unable to give their usual support.

It is observed that the bowels are almost universally constipated.

The second stage commences with the extension of pain and rigidity to the extremities. In this period there is perhaps no voluntary muscle unaffected. Every part appears to sustain more or less of the burthen of disease. Obstinate watchfulness takes place. The patient however retains the free use of his intellects and senses; which serves only to make his situation the more miserable.

The sufferings of the patient go on increasing. He feels now and then a sudden, and most painful traction about the cartilago ensiformis, which tends towards the spine. This traction evidently depends upon a spasm of the diaphragm, and has been considered as the pathognemonic symptom of tetanus. The head is also drawn backward by a fixed contraction of the

posterior muscles. The pain at the præcordia returns every ten or fifteen minutes, and seems to bring along with it a stronger retraction of the head, and a more distressing pain of the neck, ascending to the occiput. This posterior pain, and spasm, extends instantly from the occiput and neck, along the spine, to the lower extremities. The whole body is extended, rigid and immovable; or convulsed and recurvated. The jaws are either fixed open, or as more commonly occurs, rigidly locked together. Any effort of the attendants to open the jaws, when locked, or to shut the mouth when it is fixed open, hurries on the general spasms, and subjects the patient to consummate agony.

In the violence of a paroxism the muscles of the whole body and ~~extremities are thrown~~ in the strongest degree contracted, and the body and extremities are thrown into new positions, which are governed by the superior force of the largest of them. The muscles of the jaws and neck, and the pectoral and deltoid muscles, display their great power of action. The shoulders and breast are projected; the arms stretched out, or thrown across the body; and the hands either rigidly extended, or the fingers clinched.

The paroxism remits in a few minutes, and though the patient still suffers from spasm and pain, he remains for a while comparatively relaxed and easy. After every paroxism respiration is hurried, as if from excessive exercise. The face is, in some instances, pale, but for the most part flushed during the ~~paroxism~~ remission of spasm. The countenance is expressive of the most melancholy distress.

The disease has now attained its utmost violence. The patient is constantly in torture; for the spasm, scarcely remitting for a minute, is more severe and continues longer, in every succeeding paroxism. As the power of different

sets of muscles is very different, and as they act in some measure successively in the onset of the ~~disease~~ paroxism, the body is forced into various and highly painful situations. The belly is constricted and hard. The abdominal muscles do not yield to the descent of the diaphragm, which is itself in a state of painful traction, giving no assistance in respiration. Such is the state of suffering during the second stage of the disease.

The third stage, in the worst cases, or those which do not assume a convalescent crisis, is gradually established by an aggravation of all the violent symptoms, connected with a sinking of the more important functions of life.

The pulse beats, or the heart throbs with amazing frequency and irregularity, giving a peculiar palpitating motion to the epigastric region. The heat of the body diminishes. Articulation becomes indistinct; the sound of the voice is changed to a grating and horrible tone, in muttering. The eys are watery and languid. Thirst ~~becomes~~ is insatiable, and the jaws are so fast locked, that drink and nourishment, even ~~though~~ if they could be so allowed, cannot be introduced.

The exhausted sufferer enjoys no repose. Sometimes a transient coma occurring in the intervals has been mistaken for sleep; but genuine sleep is never enjoyed. A delirium more frequently than coma ensues; and this is connected with the wild and anxious countenance of agony and despair.

There is frequently a suppression of urine; or it issues with difficulty, and in jets, when the bladder is compressed. As the disease draws to a close the tongue is sometimes violently thrust between the teeth. The forehead is corrugated, the eys occasionly distorted, are commonly fixed and immoveable

in thier sockets. The nose is drawn upwards; the cheeks backwards; and the entire countenance is made to express a disagreeable, despondent, and violent grin. In the midst of all these sufferings a sudden convulsion sometimes puts an end to life. Sometimes there is a gradual diminution of the pain and spasm, with a cold and universal sweat, before the mortal convulsion comes to relieve the victim of tetanus.

Tetanus was ably and minutely described by some of the oldest writers on medicine. Hippocrates in particular has given such ~~[illegible]~~ histories of this disease as evince the utmost accuracy of pathological observation.

Most of the ancient physicians had three varieties of tetanus in thier books, but it is doubtful whether more than two very distinct ones exist in nature.

When the neck, body, and extremities, were extended, straight, rigid, and inflexible, with the jaws locked, or the mouth fixed open — the affection was strickly called tetanus.

When more violent action took place in the voluntary muscles, the posterior ones, being the most powerful, would therefore bend the body backwards, like a bow, and produce what they termed Opisthotonos. In this case the head is thrown back and remains immoveable; the anterior neck and thorax are projected forwards: a sudden increase of spasm, attended with a piercing scream, elevates the abdomen, and the patient springs on his head and heels, so that the spine and hips form an archon the bed; he tumbles to either side; or is thrown by the force of the muscular contraction with violence on the floor.

When the anterior muscles acted with most energy, bending the body forwards, the disease was termed emprosthotonos. The existence of this, as a form of tetanus, or general spasm of the voluntary muscles, is very questionable. It is not noticed in the descriptions of Hippocrates; and is thought by Dr Mosely to be a state that cannot exist. Emprosthotonos can only exist as a partial spasm, a spasm of some of the anterior muscles. For if the affection be general, the superior power of the posterior muscles, acting as they do in tetanus, will not admit of a bending forwards.

Celsus and Cælius Aurelianus distinguished nevertheless, three such varieties, as has been enumerated. I think they must have confounded a partial affection, with the true varieties of general tetanus.

Celsus says, "Neque tamen alius importunior acutiorque morbus est "quam is qui quodam rigore nervorum, modo caput scapulis, modo mentum "pectori adnectit, modo rectam et immobilem cervicem intendit. Priorem "Graeci opisthotonon inequenter emprosthotonon ultimum tetanon, "appellant."

Cælius Aurelianus in his sixth chapter on acute diseases has given a very minute description of ~~the~~ tetanus, under the general name of spasmus, which, after the greeks, he divides into three forms. There, he also terms tetanos, opisthotonos, and emprosthotonos. Tetanic affection generally, he defines to be an involuntary stretching and contraction of parts with violent and acute pain from excessive tention. He terms the Opisthonic form of the disease, Rapnus posterganeus, which litterally means a forcing of the head backwards.

I shall not in this place trace the various distinctions and arrange

ments of tetanic affection, invented by the modern nosologists. Those of Sauvages are calculated to perplex; and though Cullens are more simple, they are liable to objections. See his synopsis—

When this disease arises from organic injury, though it does not set in speedily after the accident, its course is rapid calculating from the attack. Celsus observes, and his observation is confirmed by all who have become particularly acquainted with its history, that it often kills in four days. Its fatal termination most frequently takes place on the fourth or fifth day. The much admired roman writer just mentioned says, if the patient survives the fourth day, he is out of danger. This remark appears to be by no means correct; for many die on the fifth, seventh, and even so late as the tenth day; as is well known to the moderns, and was admitted by Hippocrates. The danger is however diminished very generally, in proportion as the disease is protracted beyond the fourth day.

Tetanus from organic lesion is almost universally mortal under the usual treatment. Dr Morely says he never saved one patient who had a complete tetanus after an opperation, but that he prevented the disease in many. The success of Hippocrates was no better, in cases resulting from wounds. I shall, however, shew in the sequel, that the disease arising from such accident is not necessarially incurable.

Section, III.

It is unnecessary to dwell long on the causes of tetanus. An ample and highly interesting view of this part of the subject, is taken by the learned professor of the institutes, in the first vollume of his medical inquiries and

observations. He says "all the remote and predispeing causes of tetanus act "by inducing preternatural debility, and irritability in the muscular parts "of the body"

The father of medicine supposed that all spasms depend on repletion, or inanition, and remarked, that all diseases, arising from the former must be cured by evacuations, and those from the latter by repletion or support. There is little to be learned from such general dogmas, respecting either the pathology or cure of tetanus; notwithstanding the importance attached to his sentiments by a respectable modern writer on this disease. See Moseley on tropical diseases.

A late writer on Tetanus Dr Hamilton of Edenburg, appears to think the preceding state of the intestinal canalle is very intimately connected with the formation of the spasm. Every one observes that costiveness is an attendent of the disease. Every one knows that irritating matters in the bowels induce great variety of spasmodic affection, as chorea, hysteria, convulsion, epilepsy. Several circumstances which he enumerates, and which present themselves with great uniformity, "make it exceedingly probable" he says - "that the functions of the stomach and intestines are materially deranged, previous to the attacks, and "during the prevalence of tetanus"

The circumstance that tetanus is more frequent, in warm, than in cold climates, favours the sentiments of Dr Hamilton. The inhabitants of warm climates are by far more subject to intestinal torpor and costiveness, than those of cold or temperate lattitudes.

Dr Moseley observes in some part of his works; that the West Indians

are remarkable for a habitual retention of the contents of the bowels. He says that it is customary, with the women to have only one or two evacuations weekly. It is remarked also that much larger doses of cathartics are requisite, in order to open the bowels in the southern, than in the northern states of America. Bartons Lectures.

Section, IV.

The success of Physicians in no part of practice more precarious than in the treatment of tetanus. This is perhaps owing to their making no allowance for the difference of causes inducing it. Dr Rush ascribes the want of uniform success "to the use of the same remedies, without any respect to the nature of the causes which produced it, and to an undue reliance upon some one remedy under a belief of its specific efficacy.

Impressed with the truth of these sentiments, I feel encouraged to retrace what has been done by a number of remedies, and in various views of practice, in the expectation of ascertaining more clearly to myself, the best mode of treatment, under different states.

Venesection. This remedy has been serviceable, both in the prevention and cure of this disease. Dr Rush found bleeding to be highly useful in tetanic affection, occurring in a yellow fever patient.

And Dr Mosely states that frequent bleeding, with purging and a low diet, is the best preventive, in fractured skulls or injuries of the head. He mentions the case of one Mooshet whom he supposes was saved by a large effusion of blood from his head in an opperation for a fracture of the cranium. In this case the disease was not,

altogether prevented, but it was light and the patient recovered.

Purgatives. Dr Rush inculcates our attention to the causes of the disease. If it depends in any degree on costiveness, or the presence of worms, or any irritating substance lodged in the bowels, appropriate purgatives become necessary agents. Perhaps there is no cases of tetanus in which they should not be steadfastly employed; either by the mouth or by enema. Even in cases of organic lesion, they may prove prophylactic if administered regularly from the time of the accident so as to preserve an open state of the bowels. I have just noticed that the use of them, as prophylactics, in connection with bleeding, is recommended by Dr Moseley. But I know of no writer who lays so much stress on the administration of purgatives as Dr Hamilton.

Dr Currie of Liverpool, says he gave great relief in two cases by the exhibition of laxitive glysters.

The slight view which I have given of the state of the system at large, and particularly that of the primæ viæ, in tetanus plead powerfully in favour of their use in the treatment of it. And as far as they have been employed it appears they have been useful.

Dr Moseley is judicious in recommending apperients or glysters, cooling medicine, a cool room, and a careful regimen, as preventives of the disease, after ~~surgical operation~~ accidents or surgical operations.

Emetics. These have been rarely resorted to as remedies for tetanic affection. Dr Rush says he "unlocked the jaws of a woman "who was seized at the same time with a remitting fever by "an emetic."

From what we know of the influence of emetics on the muscular system, it would be expected to prove of some utility in the disease under consideration. To procure the best effects from vomiting it ought to be attempted by such agents as will exert a powerful influence on the system, and yet not attack the organization of the primæ viæ.

Incision. In tetanus resulting from punctured wounds, or slight injuries of tendonous parts, the knife has proved a speedy cure. Dr Chalmers has known the Opisthotonus to arise from a slight wound of the extensor tendon of the thumb by the thorn of an orange tree. He thinks in such cases one of the principal measures for preventing the spasm, is to intercept all communication between the sensorium commune and the injured part, by cutting across the tendon or making an incision quite down to the bone. It would seem, that the advantage from incision does not depend on cutting off the communication, but on giving a new state of action ~~to the part~~, perhaps an inflammatory or suppurative action, to the injured part. The common practice therefore is to enlarge the wound, or if it has nearly healed, to cut down into it, and at the same time make such application to it, as will tend speedily to excite suppuration. This plan of treatment, and every other local management, as corroding and amputating, too frequently fail. They are therefore to be attended to in conjunction with other active remedies; but must on no account be relied on alone. Sometimes indeed incision instantly removes the general disease; so that perhaps no other means

* They ought to prove useful by diverting action from the muscles to the stom
absorbents, bloodvessels, and other parts.

are afterwards necessary to complete the cure, unless a purgative to remove costiveness be considered as expedient.

Opium. This has been looked to as the anchor of hope by almost every modern physician, in the treatment of tetanus.

Opium is undoubtedly a proper remedy: but it is too often a fallible remedy. Of course it should never be solely relied on: It ought to form a part of an extended plan of safety. Dr Lind of Haslers hospital appears to have known no other remedy. He recommends it in a full dose; but his full dose, is not a great one in tetanus: in one case he gave a scruple in less than twenty four hours. The stomach will sometimes bear, Dr Moseley, observes, a dram of opium every two hours without producing sleep or diminishing the violence of any symptom. This writer adds that he never found any benefit from a large quantity where a small quantity had not first produced some evidently good effect: and elsewhere "that there are many doubts whether opium given alone, has ever been of any utility."

Wine. Dr Rush and Dr Currie have found wine highly useful when liberally employed. It has been used by other physicians with good effect since these gentlemen gave ~~this~~ their ~~experience~~ experience concerning it to the public. Tetanus has been cured by ardent spirits likewise. See Dr Rushs observations. &c.

Bark. Tonicks of the most powerful kind, must prove at least favourable, as preventives, and, when they can be administered, as curative agents. * Practice confirms what this theory requires: for Bark has been used with success.

Essential oils. The oil of amber is thought to be a considerable antispasmodic. Dr Rush has seen the happiest effects from the exhibition of six or eight drops every two hours in tetanus.

Balsams. Dr Kirkland has found the balsam of Peru of singular efficacy in violent spasmodic diseases, arising from organic lesion. Medical Surgery. I think it would prove useful as a preventive remedy; in conjunction with mild opening medicines in true tetanus, but I would hardly expect a cure from it, when the disease is established. Dr Rogers used this most powerful balsam, in a violent case of epilepsy with happy effect: a circumstance, in favour of its probable utility in tetanus. See Dr Bartons Journal.

Blistering. This is an old practice in tetanus. Celsus used the hot iron, and mustard, for the purpose. Blistering by cantharides is a milder, but I doubt if it be a more efficacious method, than that of Celsus in this disease.

Mercury. The great powers of this medicine over many diseases has led Physicians to give it a trial, wherever uncommon difficulties, are met with in practice. It is therefore often employed in dangerous affections without any well grounded experience of its utility. In such cases it is thought to be the most promising of all agents for an experiment. Fortunately its various qualities renders it, not seldom, the just theme of applause. In tetanus, calomel, as a cathartic, ought to be of some utility. But any mercurial, employed to salivate, will only amuse the slothful prescriber by the hope of a distant advantage, which he will never gain over the disease.

It may in some cases prove a useful auxiliary. Dr Rush saw a cure completed by a salivation. Dr Moseley is of opinion that Mercury used in tetanus has killed more people than it has cured.

Warm bath. The use of warm fomentations, the affusion of warm water, and immersion in the warm bath, are recommended by Celsus. Modern practice confirms the propriety of the last measure in particular cases. The warm bath is indicated by a small and very frequent pulse, or by a slow feeble one; by a low temperature of the surface and extremities; and by occasional faintings with sensations of chillness. It may perhaps be employed at any time when there is no febrile action present.

Cold bath or affusion. This was the favourite resource of Hippocrates. He says a fever with a white, thick urine is a critical solution of an Opisthotonos. He therefore advises pouring plenty of cold water on the patient, to restore the natural heat which cures the disease. He directs this practice to be followed only in the summer. The attention of Physicians was called to this remedy by Dr Wright, after it had been long neglected. Dr Currie of Liverpool, having heard of the success of Dr Wright and Dr Cochrane of Nevis, gave the cold bath a trial and was happy in the result.

Dr Rush employed the cold affusion with success, in a case arising from an injury done to one of the toes, by wearing a tight shoe.

Dr Girdlestone was uniformly unsuccessful with the cold bath in the East Indies.

Tobacco. As far as this remedy has had a trial, it has been attended with no small share of success. It promises to become one of the most valuable agents in the treatment of tetanus.

Tobacco was first used in tetanus by Dr Frederick May, when he was a student of medicine. He was directed, by his preceptor, Dr Warren, to give it a trial in a most violent case which arose from a wound. The injury in this case was produced by a nail just over the flex-or tendon of the second toe. On the twelfth day the rigidity of the neck commenced. The tobacco was not tried, untill the disease was at its height, and after other means had entirely failed to mitigate the symptoms or check its career. He administered the medicine by way of enema. And gave it in the extraordinary dose of two ounces in decoction. It is possible the whole of the strength of this large quantity of tobacco was not extracted by half a pint of water; but saturated, as it must have been, the whole of the decoction thus exhibited, could not fail to produce great effects on the muscular system.

The next trial of tobacco, communicated to the public was in a case success-fully treated by Dr Rogers. This case appeared in the Philadelphia Medi-cal and Physical Journal. 1806 He gave the medicine in the form of enema; but in a much smaller dose than that of Dr May. Dr Rogers, without knowledge of Dr Mays success, prescribed one dram in decoction, in a very formidable case, which arose from violent agitation of mind. The second enema put a stop to the opisthotonic spasm and convulsion, and the patient recovered her usual health by the assistance of purgative medicines. —

Dr Rogers informs me that he has put an immediate stop to the spasms in another similar case, by a decoction of two drams in eight ounces of water, administered by enemas. I understand there have been other trials of tobacco in the disease of which we are treating: but I am ignorant ~~however~~ of the success attending them, as they have not been laid before the public.

The success of Dr Currie in epilepsy, by means of tobacco, indicates its power over the muscles. Its speedy operation as an emetic, in any way in which is presented to the prima vie, also shews that it must greatly affect the muscles; for all emetics in full dose, do affect them very considerably. It has been found to be in practice, what theory would expect, a most powerful antispasmodic or relaxer of muscular contraction. I trust it will prove a better and more certain remedy in this terrible disease than any hitherto employed in its treatment. ——